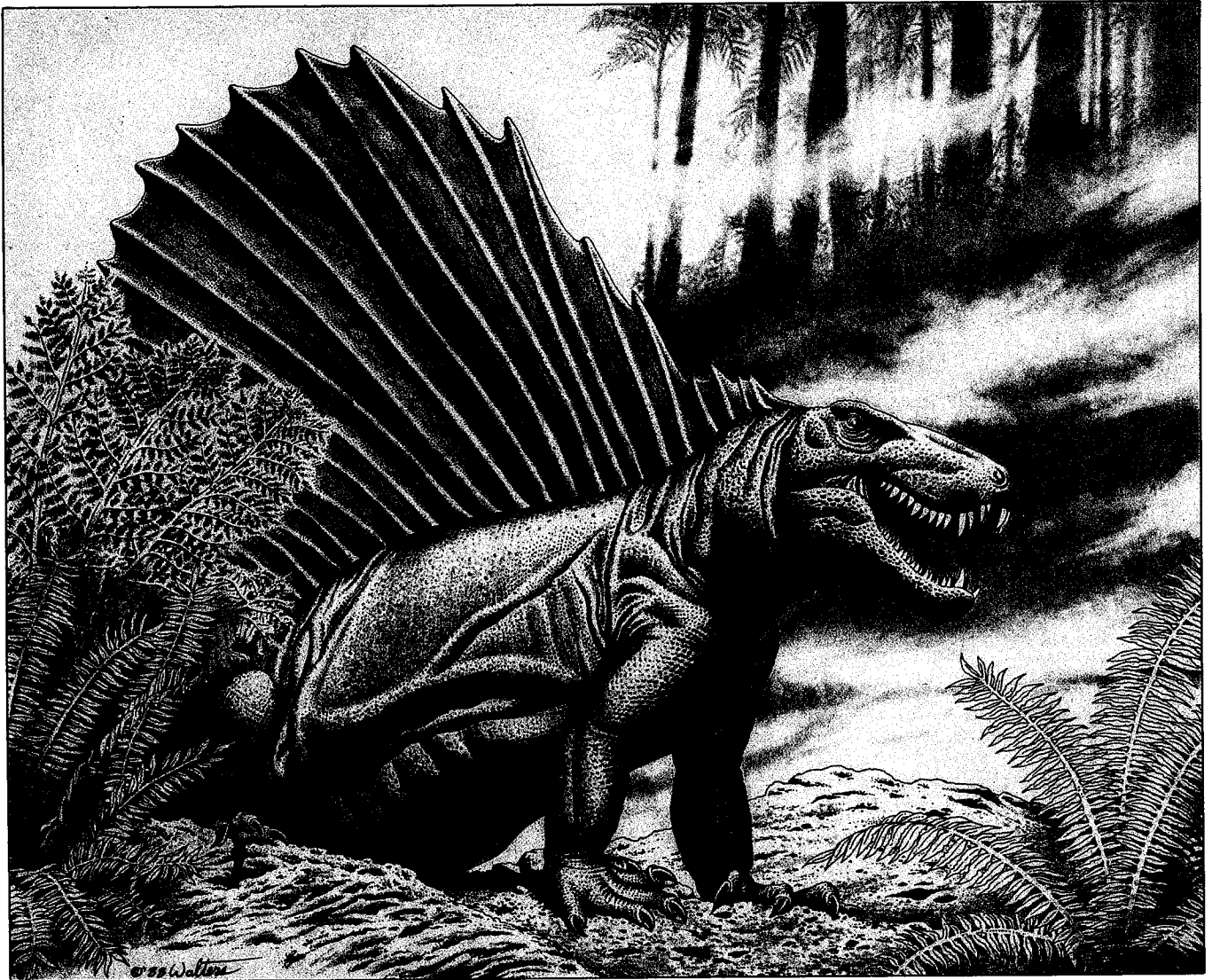


THE MOSASAUR



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The Upper Cretaceous Shark *Cretolamna appendiculata* (Agassiz) in the Raritan Formation (Cenomanian) of New Jersey

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Abstract

Impressions of teeth of the Cretaceous mackerel shark *Cretolamna appendiculata* (Agassiz) occur with impressions of the gastropod genus *Turritella* in a hard ferruginous sandstone in a claypit in Sayreville, Middlesex County, New Jersey. The source bed is the Woodbridge Clay Member of the Raritan Formation, dated palynologically as Middle (or possibly Late) Cenomanian. This occurrence is the earliest record for *Cretolamna appendiculata* and the earliest association of Cretaceous marine vertebrates with invertebrates in the Atlantic Coastal Plain province.

Introduction

The recent discovery of tooth impressions of the Upper Cretaceous mackerel shark *Cretolamna appendiculata* (Agassiz), on the same bedding plane with impressions of the marine gastropod *Turritella bakeri* Richards, serves to extend the known stratigraphic range of the genus *Cretolamna* back into the Cenomanian Stage. It also provides the earliest association of vertebrates with invertebrates in the Late Cretaceous marine deposits of the Atlantic Coast Plain.

The fossils under study were recovered in June of 1980 by James Leonard and Steve Stelz in the now-abandoned claypits formerly owned by the Sayre & Fisher Brick Company, adjacent to Main Street in the Borough of Sayreville, Sayreville Township, Middlesex County, New Jersey. (The site is now part of Tract 6, property of the International House of Pancakes.) This classic geological locality lies between the New Jersey Turnpike and the Garden State Parkway near latitude 40° 28' North, longitude 74° 20' West.

History. The Sayre & Fisher Brick Company claypits were in operation at Sayreville and Parlin for about 120 years (McCormack & Singer, 1976). The firm of Sayre & Fisher was established in 1850 as a partnership between James R. Sayre, Jr., of Newark, and Peter Fisher, Sr., of New York. At that time they began the business of manufacturing building bricks in a small brickyard adjacent to (and west of) Whitehead Dock on the Raritan River, in the town of Wood's Landing which was subsequently renamed Sayreville. The brickyards were situated near 80-foot bluffs of clay along the Raritan River. After more

than 120 years of steady digging, the clay bluffs are no more; there remain only deep-dug pits of from 20 to 50 feet below ground level (Fig. 1.). The Empire State Building in New York City is just one of the many buildings that used Sayre & Fisher bricks in its construction (Karcher, 1948).

Geology. The geology of the Sayreville claypits has been described by Owens & Sohl (1969); the paleofauna has recently been reviewed by Gallagher (1984). In the process of digging out the commercially valuable clay to manufacture bricks, Sayre & Fisher (together with competing firms established close by) uncovered the remains of a prehistoric ocean bottom as well as a coniferous paleoforest. The marine unit that yielded the shark teeth described here is composed of fine sand compacted into a ferruginous sandstone some 10 feet in thickness, exposed at about halfway the depth of the pit below ground level; below this is looser sand to a depth of 20 feet. This sandy layer in turn lies upon a compacted clay unit containing lignitized tree limbs and trunks, the remains of a Cretaceous forest. The clay also contains small globules of amber which have a very small percentage of succinic acid and are very brittle. One piece of this resinous material was found to contain three tiny flies that have been identified as members of the midge families Chironomidae and Ceratopogonidae. These insects have been figured by Case (1982, p. 154) and are currently being studied by entomologists.

Two shark teeth and a vertebral centrum occur as natural molds on a slab of sandstone along with filled burrows of marine worms and numerous gastropods of the genus *Turritella* (Fig. 2C). A similar slab containing *Turritella* collected in 1883 from the same locality was described and illustrated by Weller (1907,



p. 29, pl. LXXX), who referred it questionably to his Magothy species *T. jerseyensis*. Richards (1962, pp. 25, 27) reported that the more common species on slabs from Sayreville is *T. bakeri* Richards, which is distinguished by the presence of closely-spaced blunt nodes on its spiral ribs. Such an association of gastropods with shark teeth is unusual because differences in specific gravity would ordinarily cause the action of moving water to deposit them separately.

The Woodbridge Clay Member of the Raritan Formation has been dated palynologically as Middle or possibly Late Cenomanian, early Late Cretaceous (Christopher, 1979, 1982). The only other vertebrate fossils reported from the Raritan are a plesiosaur vertebra, the type of *Taphrosaurus lockwoodii* (Cope), and the carnivorous dinosaur bone and footprints described elsewhere in this volume (Baird, 1989).

Systematic Paleontology

Order Euselachii

Family Cretoxyrhinidae Glyckman, 1958

Genus *Cretolamna* Glyckman, 1958

Cretolamna appendiculata (Agassiz, 1843)

Material. Associated lower antero-lateral tooth, upper right posterior tooth, and vertebral centrum, preserved as natural molds. The original sandstone slab remains in the possession of the collectors; a red latex cast of it (NJSN 14017) has been deposited in the New Jersey State Museum, Trenton.

Description. The larger tooth (Fig. 2A, left) comes from an antero-lateral position in the lower jaw and has its labial (external) face exposed. It is similar to examples illustrated in Cappetta & Case (1975, pl. 3, figs. 12, 22) although they appear there in lingual views; the silhouettes of the teeth are closely comparable. Shown next to the larger tooth is a comparable tooth from the Navesink Formation (Maastrichtian) of Big Brook, Monmouth County, New Jersey (Fig. 2A, right, NJSN 14018). The smaller tooth of this report (Fig. 2B), which might easily be from the same individual, comes from a posterior position in the right upper jaw and appears in lingual aspect. It has no exact counterpart in Cappetta & Case's illustrations although the closest might be that shown in their pl. 3, fig. 27. The vertebral centrum (not illustrated) is too nebulous to merit description, as most of it is concealed except for a crescentic rim in slight relief. Nevertheless, its appearance is more that of a selachian than a teleost (bony fish) vertebra.

Discussion. As noted above, this association of vertebrate with invertebrate fossils on the same bedding plane is unusual. The specimens described here represent the first shark remains to be reported from the Raritan Formation, as well as the earliest appearance of a neoselachian species in the fossil record of New Jersey. They extend the record of *Cretolamna appendiculata* back to the lower part of the Late Cretaceous, so that its known range in New Jersey now extends from Middle Cenomanian to Middle Maastrichtian.

Acknowledgements

The author thanks James Leonard of Milford, Pennsylvania, and Steve Stelz of Leonia, New Jersey, for collecting the fossil material described in the present study. Mr. Stelz also photographed the original sandstone impressions and made a large (32 x 20 inches) red latex peel of the fossiliferous surface. The following people assisted me with information on the history and geology of Sayreville: Messrs. John B. McCormack, Sr., John B. McCormack, Jr., John E. Singer (President of the Sayreville Historical Society), Edwin A. Kolodziej, and William L. Bauer, all of Sayreville; also John F. Letts and Fred C. Herman of the Sayreville Industrial Commission, and John Korba of the Real Estate Department of the International House of Pancakes, Fort Lee, New Jersey. Dr. Donald Baird of Princeton University edited the manuscript and photographed the specimens. This research was supported by a grant from the Griffis Fund of the American Littoral Society, GF-ALS-1540.

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Figure 2. A, *Cretolamna appendiculata* (Agassiz), lower antero-lateral tooth in labial view. Shown for comparison (right) is a tooth of *Cretolamna appendiculata* Richards on the same slab surface as specimens shown in A and B. B, upper right posterior tooth in lingual view. C, *Turitella bakeri* limeters. Photos by Don Baird.